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THE TELEPHONE AND ATTENTION WAVES

APROPOS of work now being done in this laboratory[1] in the investigation of the relation between the fluctuation of auditory attention and the Traube-Hering wave, it seemed wise to settle, if possible, the fundamental question: Is the fluctuation of attention, if there is any, of central origin, or is it due to lack of uniformity of the stimulus?

The apparatus used in some earlier experiments in this laboratory as well as by several other investigators was the tone from a telephone receiver. It seemed desirable, therefore, in order to meet Hammer's objections, to have some objective check upon the apparatus that would indicate not merely the strength of current, but the movements of the diaphragm of the telephone itself. To this end we had Max Kohl mount upon the diaphragm of a telephone, by a lever, a mirror that should magnify the oscillations of the diaphragm about three times. A ray of light was thrown upon the mirror through a narrow slit and reflected into a telescope with micrometer eye-piece, and the amplitude of oscillation of the mirror could thus be read directly. In our experiments the current was interrupted by a König 50 v. d. fork. In the circuit was a variable resistance and a miliammeter. It was possible, then, to read the current strength on miliammeter and telephone diaphragm with constant current, with a single throw, and with the regular interruptions produced by the tuning-fork.

Observation of the beam of light while the fork was running showed that ordinarily there was a perfectly constant current, and that interruptions, when they came, were in the nature of single long oscillations. There was no regular change in intensity that could in any way explain the fluctuations in sound that have been called attention waves. That there is a fluctuation of attention to the sound is the opinion of all six people who have acted as subjects for this investigation. All agree that for a time the sound is heard, then it is seemingly lost in a confused mass of sensations; and although one feels that the sound is still there, one is yet quite uncertain about it. Later, out of this uncertainty and confused mass the sound emerges and once more holds the field. The fluctuations are often hard to obtain. The zone of fluctuation is much narrower than the range for vision. In consequence the observers took from fifteen minutes to an hour to adjust the resistance to a point that would give certain and constant fluctuations. But no one failed to discover the fluctuations even in a single sitting, after a few days' preliminary practise.

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[1] The psychological laboratory of the University of Michigan.

As the apparatus in question was adapted to a determination of the relation between current intensity and amplitude of vibration of the telephone receiver, and no one, so far as we know, has ever worked that problem out, in spite of the widely extended use of the telephone as a source of sound for psychological experiments, it was decided to make a few observations upon that point.

The method was as follows: All series of reading were begun with the ammeter standing at 20, and for each subsequent reading the current was reduced 1 ma. Standing at 20 a break and make in the current gave a reading of the deflection of the mirror in millimeters on the scale. The fork was started and the ammeter and millimeter reading taken under these conditions. The fork was then stopped with the hand, the current reduced 1 ma., and the reading, as above, taken, and so on. The different series were recorded independently of one another in order that the values of one series might not influence the judgment of values in another. The following table gives the results found for three typical series, though a graphic representation which shows by actual demonstration that these values lie in almost a straight line would be preferable..

Ammeter Reading. Fork not Running.	Millimeter Reading. Fork not Running.			Ammeter Reading. Fork Running.			Millimeter Reading. Fork Running.		
	I.	II.	III.	I.	II.	III.	I.	II.	III.
20	10	10	10	11	13.5	11	15	18	15
19	9.5	9.5	9.25	10 +	12.75	10 +	14 +	17.25	14 +
18	9	9	8.25	9.75—	12.25	9.75 +	13.25	17	13.75
17	8.5	8.25	7.5	9 +	10.5	9.25	12.25	15.75	12.75
16	7.75	7.5	7	8.5	10.25	9 —	11.25	15	12
15	7.25	7	6.25	8	9.25	8.5 —	10.25	14	11.5
14	6.75	6.5	5.75	7.75 —	9 +	8	9.75	13.75	10.5
13	6	5.5	5.25	7.5 —	9 —	7.5	9 —	13.5	10
12	5.75	5 +	5 —	7	8	7	8.25	11.5—	9
11	5 +	4.75	4.25	6.5	7.75	6.25	7.25	11	8
10	4.75	4.25	3.75	6	7	5.5 +	7	10	6.75
9	4.25	3.75	3 +	5	6.5	5 +	6	8	6
8	3.25	3 —	2.5	4.25	5.25	4.75	4.25	6.25	4.75
7	2.5	2.25	2	3.75	4.75	4	3.5	5	3 +
6	2	2	1.75	3.5	4	3.5	3	4	2.25
5	1.5	1.25	1.25	3 +	3.5	3	2.5	3.5	1.5
4	1	1	1	2.75	3	2.5	2	2.25	1
3	.75	.25	.75	2	1.75	2.25	1	.75	.5

No attempt at averaging the results has been made. As will be noticed, each of the three series is different slightly, although consistent in itself. This variation is apparently unavoidable in any work that depends upon contact make and break for its oscillations. Lord Rayleigh, it will be remembered, was constantly troubled by it in his work on self-inductance. In our results the variation is undoubtedly due in large part to slight changes in the position of the platinum wire that furnished the oscillating contact on the fork. We have contented ourselves, then, with giving three typical series of results that indicate at once the constancy and variability of the results. It will be noticed that there seems to be a slight relative gain of energy for the larger currents in the telephone, which makes the series increase more rapidly than the ammeter readings.

We have not attempted to fit a curve or an equation to the results, but leave them in the raw state. It will be seen that it is only very roughly that the intensity of the sound may be regarded as a function of current. Any even fairly delicate work would require correction. We have not considered here the loss of energy in the air between telephone plate and ear, which might conceivably still further modify the results.

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DISCUSSION

METAPHYSICS, SCIENCE OR ART

IN a recent number of this JOURNAL[1] Dr. Ewer contributes, under the above title, comments upon the art-character of metaphysics, in which he devotes some notice to an article of mine on 'Metaphysics as a Branch of Art.' I appreciate the courtesy of the criticism, but regret that I can not agree with his corrections.

1. Dr. Ewer holds that "The purpose of metaphysics is the purpose of science, not the purpose of art. The metaphysician aims at the discovery of truth; the artist at the production of beauty. The one constructs an idea which, he hopes and believes, correctly represents reality; the other makes a reality which expresses an idea. . . . His purpose [the metaphysician's] is to make a mental copy of reality in its important features and principles, and the thing has metaphysical worth only as it is a correct copy."[2] And the further distinction is made that metaphysics aims to tell the truth, whether pleasant or not, whereas art frankly seeks to please. Now, I believe that Dr. Ewer is quite right in adopting, as he does here, the pragmatic criterion of 'purpose.' The purpose or end of metaphysics and of art should be the test of what they are; only I do not agree to the particular purposes which are assigned. To say

[1] Vol. III., No. 20.

[2] Pp. 546–7.